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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF
Georg Rüdiger KOTZIAN
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For: Herbicidal composition

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Commissioner of Patents and Trademarks
Washington, D.C. 20231

DECLARATION UNDER RULE 132

I, Matthew CORDINGLEY, a citizen of the United Kingdom, hereby declare:

CREDENTIALS

1. That I was awarded a BSc (Honours) Degree in Biology by the University of York, United Kingdom in 1994;

2. That I have been employed by SYNGENTA Ltd (and previous legacy company, ZENECA Agrochemicals) since September 1995 in the UK (1995-2001; 2004-present) and US (2001-2004)

as a herbicide biologist and presently hold the position of Team Leader in the Global Weed Control Research Group at the Jealott's Hill International Research Centre, Bracknell, UK

3. That I have been engaged in weed control research for SYNGENTA LTD since 1995, with particular speciality in Temperate Crop Herbicides (cereals, oilseeds, sugarbeet), sugarcane herbicides and the Discovery of new herbicidal active ingredients;

4. That prior to my employment with SYNGENTA LTD, I was employed by the Pesticides Safety Directorate (PSD) – (1994-1995) an executive agency of the UK Government organisation, the Ministry of Agriculture, Fisheries and Food (MAFF; now known as DEFRA, the Department for the Environment, Farming and Rural Affairs) in positions relating to agrochemical registration in the UK and European Union

COMPARATIVE PROCEDURES

5. That the following tests were carried out in a Syngenta greenhouse facility in Stein, Switzerland and that I am reviewing the data on behalf of the applicant, Georg Rüdiger KOTZIAN, to determine the relative herbicidal actions of the following compositions comprising, as herbicides:

a) the commercial herbicide compound, tritosulfuron (i), which inhibits the action of aminolactate synthase (ALS)

b) in admixture with the commercial herbicides bromoxynil (ii), imazethapyr (iii) and pendimethalin (iv), which inhibit the action of photosystem II (PS-II), ALS and microtubule assembly, respectively

The herbicides were formulated as follows:-

Tritosulfuron:-	50g/l wettabe powder (WP050)
Bromoxymil:-	240g/l emulsifiable concentrate (EC240)
Imazethapyr:-	240g/l soluble liquid (SL240)
Pendimethalin:-	400g/l suspension concentrate (SC400)

The formulated compounds were dispersed or solubilised in water, diluted to spraying concentrations and used individually as well as in combination with each other in a post-emergence test on the following plant species

[Crops:] Wheat, Barley, Oilseed Rape, Sugarbeet, Corn, Cotton, Rice. Soybean; *[Weeds:] Sinapis arvensis, Avena fatua, Lolium perenne, Bromus tectorum, Galium aparine, Alopecurus mysuroides, Stallaria media, Veronica persica, Kochia scoparia, Chenopodium album, Polygonum convolvulus, Echinochloa crus-galli, Xanthium canadense, Cyperus esculentus, Sorghum* Sp, *Brachiara plantaginea, Abutilon theophrasti, Euphorbia heterophylla, Digitaria sanguinalis, Panicum dichotomiflorum, Sida spinosa, Amaranthus retroflexus, Ipomea purpurea,* and *Rottboellia* Sp.

The method employed was as follows:

Post-emergence herbicidal action:

All species were sown in pots using a standard clay loam soil and grown under ambient conditions in a greenhouse to the 2-3 leaf growth stage ('early post-emergence'). The herbicides were applied alone and mixture to the plant units using a automated spray applicator at standard agronomic settings. Crops and weeds were assessed 21 days after application using a 0-100% scale of % estimated biomass reduction, where 0 = no injury and 100 = dead plants.

A synergistic effect exists whenever the action of the combination of the herbicide tritosulfuron and bromoxynil (for example), is greater than the sum of the actions of the herbicides applied individually. The herbicidal action to be expected, '*We*', for a given combination of two herbicides can be calculated as follows (see COLBY, S.R. "Calculating synergistic and antagonistic response of herbicide combinations". Weeds 15, pages 20-22; 1967):

$$We = X + \left[Y \bullet (100 - X) / 100\right]$$

wherein:-

X = % herbicidal action in the case of treatment with the compound tritosulfuron using an application rate of p kg per hectare, in comparison with untreated control (= 0%);

Y = % herbicidal action in the case of treatment with bromoxynil (for example) using an application rate of q kg per hectare, in comparison with the untreated control.

We = expected herbicidal action (% herbicidal action in comparison with untreated control) after treatment with the compound tritosulfuron and the compound bromoxynil (for example) at a rate of application of p + q kg of active ingredient per hectare.

If the action actually observed is greater than the expected value *We*, then synergy exists.

6. That the following complete results as mean values were obtained for each of the three combinations reported in this declaration, together with an indication of the instances where synergy is numerically observed (i.e. actual result > *We*)

<u>Table 1</u>: Post-emergence herbicidal action of tritosulfuron and bromoxynil, individually and in combination with each other against all species tested (synergy is highlighted where apparent) at 21 days after application (21 DAA). Instances where observed value was greater than the expected value, *We*, are highlighted.

Scores are Mean % Injury

(Figures in brackets = Colby estimated values)

Compound 1	**TRITOSULFURON**		**BROMOXYNIL**		**TRITOSULFURON**			
Rate (g ai/ha)	16	4	120	30	16	16	4	4
Compound 2					**BROMOXYNIL**			
Rate (g ai/ha)					120	30	120	30
WHEAT WINTER Arina	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
BARLEY WINTER Esterel	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
RAPE WINTER Lirajet	95	80	50	5	95 (98)	90 (95)	90 (90)	85 (81)
SUGARBEET Rapid	90	90	100	70	100 (100)	100 (97)	100 (100)	80 (97)
CORN Blizzard	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
COTTON Delta Pine	70	0	90	55	60 (97)	60 (87)	55 (90)	60 (55)
RICE Koshihikari	40	0	0	0	0 (40)	0 (40)	0 (0)	0 (0)
SOYBEANS S 19-90	85	65	20	0	70 (88)	80 (85)	40 (72)	60 (65)
SINAPIS ARVENSIS	90	90	60	15	100 (96)	90 (92)	98 (96)	98 (92)
AVENA FATUA	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
LOLIUM PERENNE	0	0	25	15	0 (25)	0 (15)	2 (25)	0 (15)
BROMUS TECTORUM	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
GALIUM APARINE	0	0	0	0	70 (0)	60 (0)	20 (0)	0 (0)
ALOPECURUS MYOSUROIDES	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
STELLARIA MEDIA	75	30	0	0	80 (75)	70 (75)	30 (30)	30 (30)
VERONICA PERSICA	70	55	70	0	60 (91)	60 (70)	55 (87)	40 (55)
KOCHIA SCOPARIA	98	98	100	70	98 (100)	80 (99)	98 (100)	95 (99)
CHENOPODIUM ALBUM	98	98	98	40	98 (100)	98 (99)	50 (100)	90 (99)
POLYGONUM CONVOLVULUS	55	80	100	20	100 (100)	100 (64)	100 (100)	50 (84)
ECHINOCHLOA CRUS-GALLI	0	0	20	0	20 (20)	10 (0)	30 (20)	30 (0)
XANTHIUM L. SPEC.	0	0	30	0	70 (30)	60 (0)	30 (30)	20 (0)
CYPERUS ESCULENTUS	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
SORGHUM SP.	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
BRACHIARIA PLANTAGINEA	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
ABUTILON THEOPHRASTI	30	0	50	0	80 (65)	30 (30)	50 (50)	20 (0)
EUPHORBIA HETEROPHYLLA	50	20	30	0	40 (65)	30 (50)	30 (44)	30 (20)
DIGITARIA SANGUINALIS	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
PANICUM DICHOTOMIFLORUM	0	0	0	0	0 (0)	50 (0)	40 (0)	0 (0)
SIDA SPINOSA	20	0	25	0	25 (20)	0 (20)	60 (25)	0 (0)
AMARANTHUS RETROFLEXUS	98	80	70	30	98 (99)	98 (99)	90 (94)	90 (86)
IPOMOEA PURPUREA	70	55	30	10	70 (79)	70 (73)	20 (69)	10 (60)
ROTTBOELLIA SP.	0	0	20	0	0 (20)	20 (0)	0 (20)	0 (0)

Table 2: Post-emergence herbicidal action of tritosulfuron and imazethapyr, individually and in combination with each other against all species tested at 21 days after application (21 DAA). Instances where observed value was greater than the expected value, *We*, are highlighted.

Scores are Mean % Injury

(Figures in brackets = Colby estimated values)

Compound 1	TRITOSULFURON		IMAZETHAPYR		TRITOSULFURON			
Rate (g ai/ha)	16	4	16	4	16	16	4	4
Compound 2					IMAZETHAPYR			
Rate (g ai/ha)					16	4	16	4
WHEAT WINTER Arina	0	0	75	20	75 (76)	65 (20)	75 (75)	25 (20)
BARLEY WINTER Esterel	0	0	75	0	80 (75)	50 (0)	70 (75)	40 (0)
RAPE WINTER Lirajet	95	80	95	80	98 (100)	98 (99)	98 (99)	95 (96)
SUGARBEET Rapid	90	90	95	90	95 (100)	95 (99)	95 (100)	98 (99)
CORN Blizzard	0	0	40	0	30 (40)	0 (0)	30 (40)	0 (0)
COTTON Delta Pine	70	0	0	0	80 (70)	60 (70)	75 (0)	50 (0)
RICE Koshihikari	40	0	40	30	40 (64)	20 (58)	60 (40)	0 (30)
SOYBEANS S 19-90	85	65	60	30	90 (94)	80 (90)	75 (86)	70 (76)
SINAPIS ARVENSIS	90	90	100	95	98 (100)	95 (100)	98 (100)	98 (100)
AVENA FATUA	0	0	60	50	70 (60)	65 (50)	60 (60)	20 (50)
LOLIUM PERENNE	0	0	70	40	75 (70)	50 (40)	70 (70)	30 (40)
BROMUS TECTORUM	0	0	60	0	70 (60)	30 (0)	65 (60)	0 (0)
GALIUM APARINE	0	0	70	50	70 (70)	85 (50)	70 (70)	60 (50)
ALOPECURUS MYOSUROIDES	0	0	60	0	60 (60)	10 (0)	70 (60)	0 (0)
STELLARIA MEDIA	75	30	50	50	70 (88)	70 (88)	50 (65)	20 (65)
VERONICA PERSICA	70	55	100	98	100 (100)	100 (99)	100 (100)	70 (99)
KOCHIA SCOPARIA	98	98	95	70	100 (100)	98 (99)	90 (100)	75 (99)
CHENOPODIUM ALBUM	98	98	98	80	100 (100)	100 (99)	90 (100)	90 (100)
POLYGONUM CONVOLVULUS	55	80	100	98	100 (100)	100 (99)	98 (100)	98 (100)
ECHINOCHLOA CRUS-GALLI	0	0	20	0	55 (20)	50 (0)	60 (20)	60 (0)
XANTHIUM L. SPEC.	0	0	30	30	55 (30)	20 (30)	60 (30)	70 (30)
CYPERUS ESCULENTUS	0	0	30	0	30 (30)	60 (0)	20 (30)	30 (0)
SORGHUM SP.	0	0	60	0	90 (60)	60 (0)	80 (60)	0 (0)
BRACHIARIA PLANTAGINEA	0	0	90	70	90 (90)	60 (70)	95 (90)	75 (70)
ABUTILON THEOPHRASTI	30	0	90	70	95 (93)	95 (79)	95 (90)	90 (70)
EUPHORBIA HETEROPHYLLA	50	20	50	50	70 (75)	70 (75)	80 (60)	50 (60)
DIGITARIA SANGUINALIS	0	0	95	40	98 (95)	60 (40)	95 (95)	50 (40)
PANICUM DICHOTOMIFLORUM	0	0	100	70	98 (100)	95 (70)	100 (100)	60 (70)
SIDA SPINOSA	20	0	90	70	85 (92)	60 (76)	80 (90)	80 (70)
AMARANTHUS RETROFLEXUS	98	80	100	90	98 (100)	98 (100)	98 (100)	95 (98)
IPOMOEA PURPUREA	70	55	80	60	95 (94)	90 (88)	80 (91)	70 (82)
ROTTBOELLIA SP.	0	0	60	40	60 (60)	10 (40)	50 (60)	10 (40)

Table 3: Post-emergence herbicidal action of tritosulfuron and pendimethalin, individually and in combination with each other against all species tested at 21 days after application (21 DAA). Instances where observed value was greater than expected value, *We*, are highlighted.

Scores are Mean % Injury

(Figures in brackets = Colby estimated values)

Compound 1	TRITOSULFURON		PENDIMETHALIN		TRITOSULFURON			
Rate (g ai/ha)	16	4	500	125	16	16	4	4
Compound 2					PENDIMETHALIN			
Rate (g ai/ha)					500	125	500	125
WHEAT WINTER Arina	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
BARLEY WINTER Esterel	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
RAPE WINTER Lirajet	95	80	65	30	98 (98)	98 (97)	90 (93)	80 (86)
SUGARBEET Rapid	90	90	20	20	90 (92)	90 (92)	80 (92)	80 (92)
CORN Blizzard	0	0	0	0	20 (0)	0 (0)	0 (0)	0 (0)
COTTON Delta Pine	70	0	70	50	75 (71)	70 (85)	50 (70)	50 (50)
RICE Koshihikari	40	0	0	0	20 (40)	15 (40)	0 (0)	0 (0)
SOYBEANS S 19-90	85	65	70	30	90 (96)	80 (90)	60 (90)	75 (76)
SINAPIS ARVENSIS	90	90	70	40	100 (97)	90 (94)	90 (97)	80 (94)
AVENA FATUA	0	0	40	0	30 (40)	0 (0)	30 (40)	0 (0)
LOLIUM PERENNE	0	0	40	0	40 (40)	0 (0)	0 (40)	0 (0)
BROMUS TECTORUM	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
GALIUM APARINE	0	0	0	0	70 (0)	90 (0)	70 (0)	40 (0)
ALOPECURUS MYOSUROIDES	0	0	20	0	30 (20)	0 (0)	10 (20)	0 (0)
STELLARIA MEDIA	75	30	55	10	98 (89)	80 (78)	95 (69)	80 (37)
VERONICA PERSICA	70	55	80	65	75 (94)	70 (90)	75 (91)	30 (84)
KOCHIA SCOPARIA	98	98	75	70	100 (100)	100 (99)	98 (100)	98 (99)
CHENOPODIUM ALBUM	98	98	70	70	100 (99)	100 (99)	100 (99)	100 (99)
POLYGONUM CONVOLVULUS	55	80	50	30	100 (78)	100 (69)	60 (90)	50 (86)
ECHINOCHLOA CRUS-GALLI	0	0	90	80	80 (90)	80 (80)	85 (90)	80 (80)
XANTHIUM L. SPEC.	0	0	0	0	0 (0)	0 (0)	25 (0)	0 (0)
CYPERUS ESCULENTUS	0	0	0	0	0 (0)	0 (0)	0 (0)	0 (0)
SORGHUM SP.	0	0	25	0	0 (25)	0 (0)	25 (25)	0 (0)
BRACHIARIA PLANTAGINEA	0	0	90	60	80 (90)	90 (60)	90 (90)	90 (60)
ABUTILON THEOPHRASTI	30	0	80	70	70 (86)	60 (79)	70 (80)	60 (70)
EUPHORBIA HETEROPHYLLA	50	20	30	30	50 (65)	60 (65)	25 (44)	25 (44)
DIGITARIA SANGUINALIS	0	0	90	80	90 (90)	80 (80)	90 (90)	70 (80)
PANICUM DICHOTOMIFLORUM	0	0	100	90	90 (100)	80 (90)	95 (100)	70 (90)
SIDA SPINOSA	20	0	65	55	20 (72)	30 (64)	80 (65)	30 (55)
AMARANTHUS RETROFLEXUS	98	80	40	25	100 (99)	95 (99)	95 (88)	95 (85)
IPOMOEA PURPUREA	70	55	70	50	100 (91)	90 (85)	80 (87)	80 (78)
ROTTBOELLIA SP.	0	0	80	60	40 (80)	40 (60)	50 (80)	10 (60)

Comments:

The results in Table 1 indicate that whilst crop safety from the mixture is retained in the key crops wheat, barley, corn and rice, synergy is seen consistently on critical weeds of those crops at various rate combinations. For example *Sinapis arvensis* and *Galium aparine* (cereals), *Echinochloa crus-galli* (rice/corn/cereals), *Xanthium* L. spec., *Abutilon theophrasti, Panicum dichotomiflorum* and *Sida spinosa* (corn)

The results in Table 2 indicate that crop safety in corn is retained and that synergy is widespread across many species at certain rate combinations; some key examples include: *Bromus tectorum, Echinochloa crus-galli, Xanthium L.* spec., *Sorghum* spec., *Abutilon theophrasti* and *Digitaria sanguinalis.*

The results in Table 3 indicate that crop safety is retained in wheat, barley, corn and rice whilst synergy is seen at certain rate combinations in the key weeds *Galium aparine* and *Stellaria media* (cereals), *Polygonum convolvulus, Amaranthus retroflexus, Ipomea purpurea* (corn).

CONCLUSIONS

7. That the above results in Tables 1, 2 and 3 demonstrate a surprising effect where the synergism seen on certain weed species does not occur on certain crops (thus continuing to render the mixture safe for use in that crop) for the following mixtures on the crops indicated:-

Tritosulfuron + bromoxynil	[wheat, barley, corn (maize), rice]
Tritosulfuron + imazethapyr	[corn]
Tritosulfuron + pendimethalin	[wheat, barley, corn, rice]

8. That the results shown in tables 1, 2 and 3 demonstrate unexpected synergistic herbicidal activity on certain weeds and at certain rates of mixtures of tritosulfuron with either bromoxynil, imazethapyr or pendimethalin, since the herbicidal activity of the mixture is not only superior to the relative performance of each individual component taken at the same rates as used in the mixture, but is also greater than the predicted additive effect given by the Colby formula.

9. That this superior herbicidal performance is important because it allows a more efficient post-emergent control of the said weeds at significantly lower application rates in a number of crop production systems.

FINAL STATEMENT

I, Matthew CORDINGLEY, declare further that all statements made herein of personal knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United

States Code, and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Signed this 14th day of April, 2008.

M Cordingley

Matthew CORDINGLEY